

CLAIMS

Sub a¹ 1. An image processing apparatus comprising:

5 an image processing part for receiving images captured by a plurality of cameras shooting surroundings of a vehicle to generate a synthetic image viewed from a virtual point of view from these camera images,

10 wherein the image processing part changes at least one selected from a position, a direction of a line of sight, and a focal length of the virtual point of view in accordance with a running state of the vehicle.

2. The image processing apparatus of claim 1,

15 wherein the image processing part changes at least one selected from a position, a direction of a line of sight, and a focal length of the virtual point of view in accordance with a running speed of the vehicle.

3. The image processing apparatus of claim 1,

20 wherein the image processing part changes at least one selected from a position, a direction of a line of sight, and a focal length of the virtual point of view, and controls capturing of an image outside a view range of the changed virtual point of view.

25 4. The image processing apparatus of claim 3,

wherein the image processing part controls the

capturing of an image outside a view range of the changed virtual point of view by changing a model for image synthesis.

5. The image processing apparatus of claim 1,

5 wherein the image processing part changes at least one selected from a position, a direction of a line of sight, and a focal length of the virtual point of view in accordance with a steering angle of the vehicle.

10 6. The image processing apparatus of claim 1,

 wherein the vehicle includes an object detecting sensor for detecting an obstacle, and

 the image processing part changes at least one selected from a position, a direction of a line of sight, and a focal
15 length of the virtual point of view in accordance with results of detection by the object detecting sensor.

7. The image processing apparatus of claim 1,

 wherein the image processing part includes an original
20 mapping table and generates a synthetic image using a mapping table that is cut out from the original mapping table, and

 the image processing part changes at least one selected from a position, a direction of a line of sight, and a focal
length of the virtual point of view by changing the mapping
25 table to be cut out from the original mapping table.

8. An image processing apparatus comprising:

an image processing part for receiving images captured by a plurality of cameras shooting surroundings of a vehicle to generate a synthetic image viewed from a virtual point of view from these camera images,

5 wherein the image processing part controls capturing of
an image outside a view range of the virtual point of view in
accordance with a running state of the vehicle.

9. A monitoring system comprising:

10 a plurality of cameras shooting surroundings of a
vehicle;

an image processing part for receiving images captured by the plurality of cameras to generate a synthetic image viewed from a virtual point of view from these camera images;

15 and

a display part for displaying the synthetic image,

wherein the image processing part changes at least one selected from a position, a direction of a line of sight, and a focal length of the virtual point of view in accordance with a running state of the vehicle.

10. An image processing apparatus comprising:

an image processing part for receiving images captured
by a plurality of cameras shooting surroundings of a vehicle
25 to generate a synthetic image from these camera images,

wherein the image processing part generates an image including a first image and a second image as the synthetic

image,

the first image being viewed from the virtual point of view,

the second image being viewed from a viewpoint that is
5 different from the virtual point of view of the first image
in at least one selected from a position, a direction of a
line of sight and a focal length, or

the second image being different from the first image
in a model.

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11. The image processing apparatus of claim 10,

wherein the second image is at least one of the camera
images.

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12. The image processing apparatus of claim 10,

wherein the first image is a close view image showing
the vehicle and surroundings thereof, and

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the second image is a distant view image showing an
area distant from the surrounding area of the vehicle that is
shown by the close view image.

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13. The image processing apparatus of claim 12,

wherein the image processing part arranges the distant
view image around the close view image in the synthetic image.

14. The image processing apparatus of claim 13,

wherein the distant view image is an image having

continuity with the close view image.

15. The image processing apparatus of claim 10, wherein

the first image shows at least a part of the vehicle
5 and at least a part of the surroundings of the vehicle, and
the second image is obtained by enlarging at least a
part of the region shown by the first image.

16. A monitoring system comprising:

10 a plurality of cameras shooting surroundings of a
vehicle;

an image processing part for receiving images captured
by the plurality of cameras to generate a synthetic image
from these camera images; and

15 a display part for displaying the synthetic image,

wherein the image processing part generates an image
including a first image and a second image as the synthetic
image,

20 the first image being viewed from a virtual point of
view,

the second image being viewed from a viewpoint that is
different from the virtual point of view of the first image
in at least one selected from a position, a direction of a
line of sight and a focal length, or

25 the second image being different from the first image
in a model.

17. An image processing apparatus comprising:

an image processing part for receiving images captured by a plurality of cameras shooting surroundings of a vehicle to generate a synthetic image from these camera images,

5 wherein in the synthetic image, the image processing part displays at least a part of a vehicle region where the vehicle is present, and an attention drawing region for drawing attention in which at least a part of the surroundings of the vehicle is shown.

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18. The image processing apparatus of claim 17,

wherein the synthetic image is an image viewed from a virtual point of view that is set above the vehicle.

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19. The image processing apparatus of claim 17,

wherein the image processing part displays an illustration image or an actual image of the vehicle on the vehicle region.

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20. The image processing apparatus of claim 17,

wherein the attention drawing region includes at least a part of a blind spot region around the vehicle that is not shot by any of the cameras.

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21. The image processing apparatus of claim 17,

wherein the attention drawing region corresponds to the blind spot region around the vehicle that is not shot by any

of the cameras.

22. The image processing apparatus of claim 20 or 21,

5 wherein the image processing part determines a range of a region obtained by combining the blind spot region and the vehicle region, using region data showing a projection region of the vehicle in each camera image.

23. A monitoring system comprising:

10 a plurality of cameras shooting surroundings of a vehicle;

an image processing part for receiving images captured by the plurality of cameras to generate a synthetic image from these camera images; and

15 a display part for displaying the synthetic image,

wherein in the synthetic image, the image processing part displays at least a part of a vehicle region where the vehicle is present, and an attention drawing region for drawing attention in which at least a part of the
20 surroundings of the vehicle is shown.

24. An image processing apparatus comprising:

an image processing part for receiving images captured by a plurality of cameras shooting surroundings of a vehicle
25 to generate a synthetic image from these camera images,

wherein the image processing part generates the synthetic image, using a mapping table including first

mapping data describing a correspondence relationship between pixels of the synthetic image and pixels of the camera images, and second mapping data describing an identifier showing that a pixel of the synthetic image corresponds to pixel data
5 other than the camera images.

25. The image processing apparatus of claim 24,
wherein the pixel data other than the camera images show the vehicle or a blind spot region that is present in at
10 least a part of the surroundings of the vehicle.

26. The image processing apparatus of claim 24,
wherein the image processing part stores a predetermined image other than the camera images, and
15 with respect to the pixel of the synthetic image, the second mapping data describe coordinate values corresponding to the pixel in the stored predetermined image.

27. The image processing apparatus of claim 24,
20 wherein the second mapping data describe pixel data corresponding to the pixel of the synthetic image.

28. An image processing apparatus comprising:
an image processing part for receiving images captured
25 by a plurality of cameras shooting surroundings of a vehicle to generate a synthetic image from these camera images,
wherein the image processing part uses mapping data

describing a correspondence relationship between pixels of the synthetic image and a plurality of pixel data including one or both of pixel data of the camera images and pixel data other than the camera images, and describing a rate of necessity with respect to each of the pixel data, and weights each pixel data in accordance with the rate of necessity,

thereby generating the pixel data of the pixels of the synthetic image.

29. An image processing apparatus comprising:

an image processing part for receiving images captured by a plurality of cameras shooting surroundings of a vehicle to generate a synthetic image from these camera images,

wherein the image processing part includes an original mapping table, cuts out a mapping table describing a correspondence relationship between pixels of the synthetic image and pixels of the camera images, and generates the synthetic image, using the cut-out mapping table.